SCH3U

F: Gas Laws and Atmospheric Chemistry

Unit Plan Overview

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| Unit of Study: Gases and Atmospheric Chemistry | | |
| Curriculum: What will students learn? | Summary:  The focus of this unit for students to properly predict and describe the properties of gases (qualitatively and quantitatively). The societal and environmental impact of how air quality can be affected by human activities and technology. It is the responsibility of people to protect the integrity of the Earth’s atmosphere. | Overall Expectations:  F1. analyse the cumulative effects of human activities and technologies on air quality, and describe  some Canadian initiatives to reduce air pollution, including ways to reduce their own carbon  footprint;  F2. investigate gas laws that explain the behaviour of gases, and solve related problems;  F3. demonstrate an understanding of the laws that explain the behaviour of gases.  -Students are given a daily handout with the key knowledge and equations (with an example).  -Introduce culminating activity. Students are given one expectation from the curriculum documents and must perform it in a way that can be filmed and incorporated into a class film. About 5-10 minutes are allotted per student/group video clip. The film can be watched on a review day before the test. Students will be provided with a choice board (students can do other activities than on the choice board, but those must be verified with the teacher first). |

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| Lesson (Title and topic) | Day | Expectation Codes | Lesson Strategy and Assessment | Evaluation including criteria addressed from Achievement Chart |
| States of Matter Review | 1 | F3.2 | -Diagnostic with multiple choice assessment questions for entire unit. Class discusses answers briefly. (This would feel like a test review and let the students foresee the types of questions they will be asked on the unit test. If the students understand how to answer these questions, then they should be able to do well on the unit test).  -Answer questions on the website. (students write out letter answer on a blank sheet of paper) from the following website: <http://www.edinformatics.com/math_science/states_of_matter.htm>  -Use poker chips to explain how particles act with states of matter. Works out misconceptions. Have a poker chips worksheet. (Diagrams, short answer questions, etc.)  -Have volunteers interact with java applets that are also on the website above. | -Multiple choice questions on website.  -Diagnostic test (only for a completion mark). Briefly clarify misconceptions.  -Hand in poker chips worksheet. |
| Kinetic Molecular Theory | 2 | F3.3 | -Ppt presentation with diagnostic questions (each pair of students answers a question. Have a class discussion afterwards).  -Quick water temperature lab on putting hands in room temperature for a few minutes, and then place one hand in hot water and the other in cold water.  -Class discussion and board work for introducing KMT.  -Teacher shows four demos in the form of PEOEs.  -Use the following website on the class computer and have a volunteer from each group interact with the following website’s activity. http://phet.colorado.edu/en/contributions/view/2816 | -Students submit PEOE charts (page with four boxes) for grading (via a rubric).  -Students show teacher diagrams based on the website activity (marked on the spot)  -Students write a paragraph on the water temperature lab explaining their observations/feelings using a description of a molecular model. Draw diagrams. |
| Atmospheric Pressure and Components of the Atmosphere | 3 | F2.1  F3.1 | -For the students to realize that there are numerous sections that comprise the Earth’s atmosphere and each of those consist of different gases  -Ppt presentation. The purpose of the earth’s atmosphere: ‘Why do we need it?’-Think-pair-share on about a quote in the ppt.  -Groups of students come up with six test-like questions to write in their question booklets and prepare an answer sheet. Switch materials with other 4 other groups and answer their questions. | -Knowledge-based lesson  -Peer evaluation (using rubric for quality of questions, quality of answers, fairness of questions, number of correct answers). |
| Gas Laws: Boyle’s, Charles’, Guy-Lussac’s | 4 | F2.3 | -“Water Rising” PEOE (water rises under an inverted beaker with a lit candle underneath)  -Review lab safety (with candles)  -Brief introduction to the gas laws (board work and discussion)  -Distribute poker chips to each group and ask students to manipulate the density (and other properties) of the particles in different situations (changes in temperature, volume, pressure).  -End the class with ‘Chemistry Rap’ about the Ideal Gas Law. | -Formative evaluation of “Water Rising” with a response journal  -Observe and make note of individual participation throughout the lab. (via rubric) |
| Gas Laws - Introduction and Work Period/Presentations | 5,6 | F2.1  F2.3  F3.5 | -This activity is designed for students to communicate with the teacher their understanding of three of the gas laws (Boyle’s Law, Charles’s Law, and Gay-Lussac’s Law). A choice of the method of communication will be given to the students, so that the student can demonstrate his/her knowledge of the topic in the most effective way.  -Teacher judges how much time will be needed for in-class performances. | -Communication-based lesson  -Students choose options from a choice board (storybook/poster, rap/song, skit/anecdote, analyse mathematical equations/graphs with pictures/words). Paper copies of choice board will be handed in after the presentation. Students can work in groups if they wish of no more than four people.  -Rubric for evaluation guidelines. |
| Combined Gas Law | 7 | F2.3 | -Show calculations on board of how to combine Boyle’s and Charles’s laws.  -Browse YouTube for good videos. | -A question is written on board at the beginning of class. Students given time to answer it at end of class as an exit ticket. |
| Ideal Gas Law | 8 | F2.1  F2.3 | -Direct instruction (manipulate the idea gas laws to solve for unknown variables)  -Inquiry questions as a group (eg. what happens to pressure if volume remains the same and temperature increases?)  -Use a projector or SMARTBoard to interact with a Gas Laws interactive activity on the following website: <http://phet.colorado.edu/en/simulation/gas-properties>. Refer to the website’s teacher guide for lesson plan details. | -A question is written on board at the beginning of class, Students given time to answer it at end of class as an exit ticket.  -Students individually submit a one page reflection of how they students went about answering the questions. Describe the ideal gas law. Discuss the roles of group members during the inquiry process. Write about what they are still unclear of about the topic. |
| Combined/Ideal Gas Laws Work Period | 9 | F2.3 | -Groups answer questions together. Teacher walks around and announces to the class how many groups have the answer correct. Students from all groups will get up and compare their answers with other groups. The teacher confirms the answer when students are confident their answer is correct and the teacher feels is it the right time to share the correct answer with the entire class. Have students come up with the explanations. | -Students complete a worksheet together in groups during class, and are able to mingle with students around the class. Worksheets are collected and are peer marked.  -Two to three questions will be given as exit tickets for the class. |
| Cumulative Activity | 10 |  | -Planning for unit activity | -Groups submit a rough proposal of the key points they will include in their performances and how they will perform it. |
| Popcorn “Pop” | 11 | F2.2  F2.3  F3.4 | -This activity is designed for students to use their knowledge of the ideal gas law to calculate the pressure inside a popcorn kernel needed for it to pop. This lab requires algebraic skills to convert Celsius into Kelvin and mass into moles, to calculate percent composition by mass, and to utilize the ideal gas formula to solve for an unknown. This lab also tests the student’s general laboratory skills such as using a Bunsen burner and balance, and determining the volume of an object using the water displacement technique. | -Inquiry-based activity  -Pre-lab questions to be submitted the previous day. Marked (rubric) pre-labs are returned to students at the beginning of class.  -Submit a formal lab report (answer questions on lab worksheet in the discussion area). |
| Gas Mixtures and Dalton’s Law of Partial Pressures | 12 | F2.1  F2.2  F3.5 | -Use Scuba diving case studies (and real life stories) to explain Dalton’s Law of Partial Pressures. Students learn how to read dive tables from the following website: <http://home.flash.net/~table/table/index.htm> | -A question is written on board at the beginning of class. Students given time to answer it at end of class as an exit ticket. |
| Air Quality and Canada’s Initiatives | 13 | F1.2  F1.2 | -Groups of students create a RAFT presentation (write newspaper articles; act out news broadcasts, etc.).  -Class is involved in a debate to convince a rich person that their company deserves $100,000 funding to put into researching how to improve air quality. Key points of the debate are posted on a wiki.  -Use the following wiki as a resource: http://mr-taylor-sch3u-irp.wikispaces.com/Atmospheric+Chemistry | -Rubric for participation in the debate.  -Rubric for RAFT presentation.  -Wiki positing. |
| Reactions of Gases and Avogadro’s Hypothesis | 14 | F2.5  F3.6 | -Watch YouTube videos until class is engaged in a discussion.  -Direct instruction where students take notes.  -Seven lab stations: 1) syringes, 2) plastic bottles with balloons, 3) magnesium carbonate, sulphuric acid, and bubble bath neutralize, 4) marshmallows change shape, 5) hot plate and balloon, 7) read about the history of a hot air balloon. <http://jchemed.chem.wisc.edu/HS/Journal/Issues/2008/OctACS/ACSSub/JCESupp/JCE2008p1372W.pdf> | -A question is written on board at the beginning of class. Students given time to answer it at end of class as an exit ticket.  -Lab report (rubric) |
| Gas Stoichiometry | 15 | F2.4 | -Browse YouTube videos and start a discussion with students on the topic.  -Board work (learn how to use RICE tables...reaction, initial, change, end).  -Students start completing a worksheet in class which they hand in while walking in the door of the next class. | -Worksheet |
| Culminating Activity | 16 |  | -Start filming. | -Scripts and proposals must be submitted to teacher before filming. |
| Methane Gas Production From Landfills | 17, 18 | F1.1  F1.2 | - For the students to realize that carbon dioxide is not the only greenhouse gas of concern.  - How methane is produced, ways of preventing landfill explosions and possible alternatives to landfills.-Computer group research in computer lab and create a FAQ sheet.  -Jigsaw activity the next day.  -Lead the students to keep them on topic.  Have a class discussion at the end of each day to ensure the students learned what was intended for them to learn. | -Application-based activity  -Paragraph reflection written on short news article on recent landfill explosion in Maryland due to methane gas:  <http://wjz.com/local/methane.gas.pump.2.626873.html>  -Self evaluation for effectiveness in Jigsaw. (In the form of a short answer questionnaire that only the teacher will see.) Teacher incorporates these evaluations into mark for the quality of work in the home group’s Jigsaw. |
| Review Day 1 | 19 |  | -Last minute touches for groups that are still filming. Filming should be done.  -Game day with ppt and SMART Board if time permits.  -Question period | -All video clips must be submitted at the end of class to the teacher. |
| Review Day 2 | 20 |  | The teacher compiles the video clips and the class watches the film and asks questions. | -Students comment on each of the video clips in short answer form (two points on things they liked about the performance and two positive constructive criticisms...) |
| Unit Test | 21 | F1.  F2.  F3. |  |  |